

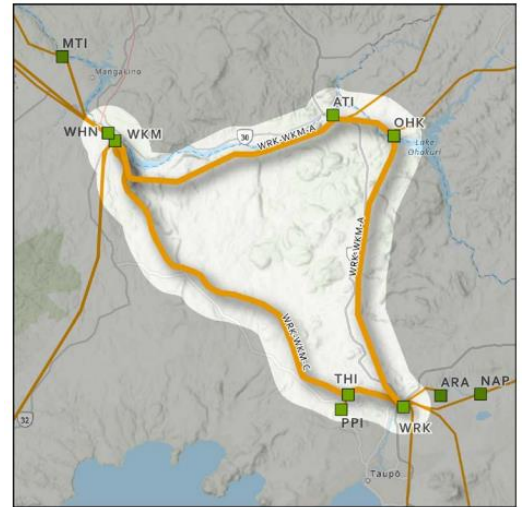


## Wairakei Ring Series Reactor

New renewable electricity generation is being developed in the Hawkes Bay and Taupo districts. There is also new wind generation being commissioned further south in the Manawatu region. To enable the additional electricity that will be generated here to be exported to other regions, there is a need to increase the transmission capacity of the national grid in the Wairakei area. This need will occur when the new power stations become operational, in around 2023.

### What is the Wairakei Ring?

The “Wairakei Ring” is made up of the four 220 kV transmission lines between Wairakei and Whakamaru. These transmission lines enable bulk electricity transfer between the central and lower North Island, Hawke’s Bay, the Bay of Plenty, and through into the Waikato and Upper North Island regions.



*The transmission lines that make up the “Wairakei Ring” run between Wairakei and Whakamaru.*

There are two transmission corridors within the ring— the southern corridor contains a large transmission line (completed in 2013) that directly connects Transpower’s Wairakei and Whakamaru substations. The northern corridor contains a chain of older, smaller capacity lines, that pass via Ohakuri and Atiamuri power stations.

### How the existing Wairakei Ring may constrain electricity flow

As more generation is installed in nearby regions, the lower-capacity northern corridor of the Wairakei Ring is likely to constrain transmission through both corridors. Once the northern corridor reaches capacity, all transmission lines in the Wairakei Ring would become constrained, even though there would still be considerable unused capacity on the southern corridor.

### Solving the need with a series reactor

We can address this issue in a number of ways as new renewable generation is added to the grid in nearby regions. One option is to increase the capacity of the older lines on the northern corridor. Another option is to replace these lines. These options will be further considered as part of our long-term plans as renewable generation in nearby regions increases.

As an interim step, we can install a device known as a series reactor, at a very modest cost, to manage the flow of electricity in a way that increases overall capacity through the area. A series reactor can help to balance the flow of electricity between the southern and northern corridors. It will allow a significant



*Series reactors under construction at Penrose Substation*

INFORMATION SHEET

Keeping the energy flowing

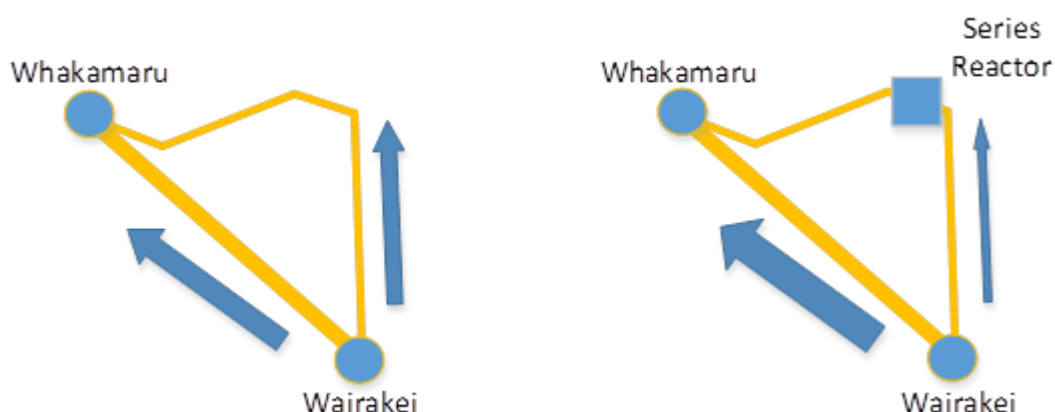


increase in the amount of electricity that can transfer through the area by approximately 500-600MW.

It is planned that the series reactor will be installed at the Transpower substations at either Atiamuri or Ohakuri power stations. Series reactors are used in other places too, for example at our Penrose substation in Auckland.

### How a series reactor will work

A series reactor will limit the flow of electricity through the northern corridor, forcing it onto the higher capacity southern corridor. Through doing that, it will increase the total amount of electricity that can flow through the area. The device works by increasing the impedance (how much the circuit impedes the flow of current) of the transmission circuit it is installed on, which in turn pushes flow through parallel paths.



*A series reactor reduces flows on the smaller northern transmission line, allowing better utilisation of the larger southern transmission line and an overall increase in transfer capacity.*

### A cost-effective initial investment

Compared to other upgrade options, the series reactor is significantly cheaper and faster to install and is therefore a sensible 'low regrets' first step in upgrading electricity transfer in the area. As part of our investigation we have modelled a range of scenarios of future electricity generation and demand developments. In all scenarios modelled, we found a benefit from installing the series reactor. The benefits to consumers of releasing low-cost renewable generation in the area more than outweigh the cost of the equipment and installation.

We are planning to commission the series reactor in early 2023 in anticipation of new electricity generation being commissioned in 2023. The indicative cost is \$12m and, given its value, this grid enhancement does not require separate Commerce Commission approval. We are currently finalising where the series reactor should be sited and initiating preliminary design.

It is expected that as the needs of the electricity transmission system change in the future, there will be a need for further investment in the Wairakei area. We will continue to monitor and investigate further options along with the optimal timing.

Updated: April 2021

For more information, call Transpower on **0508 526 369**